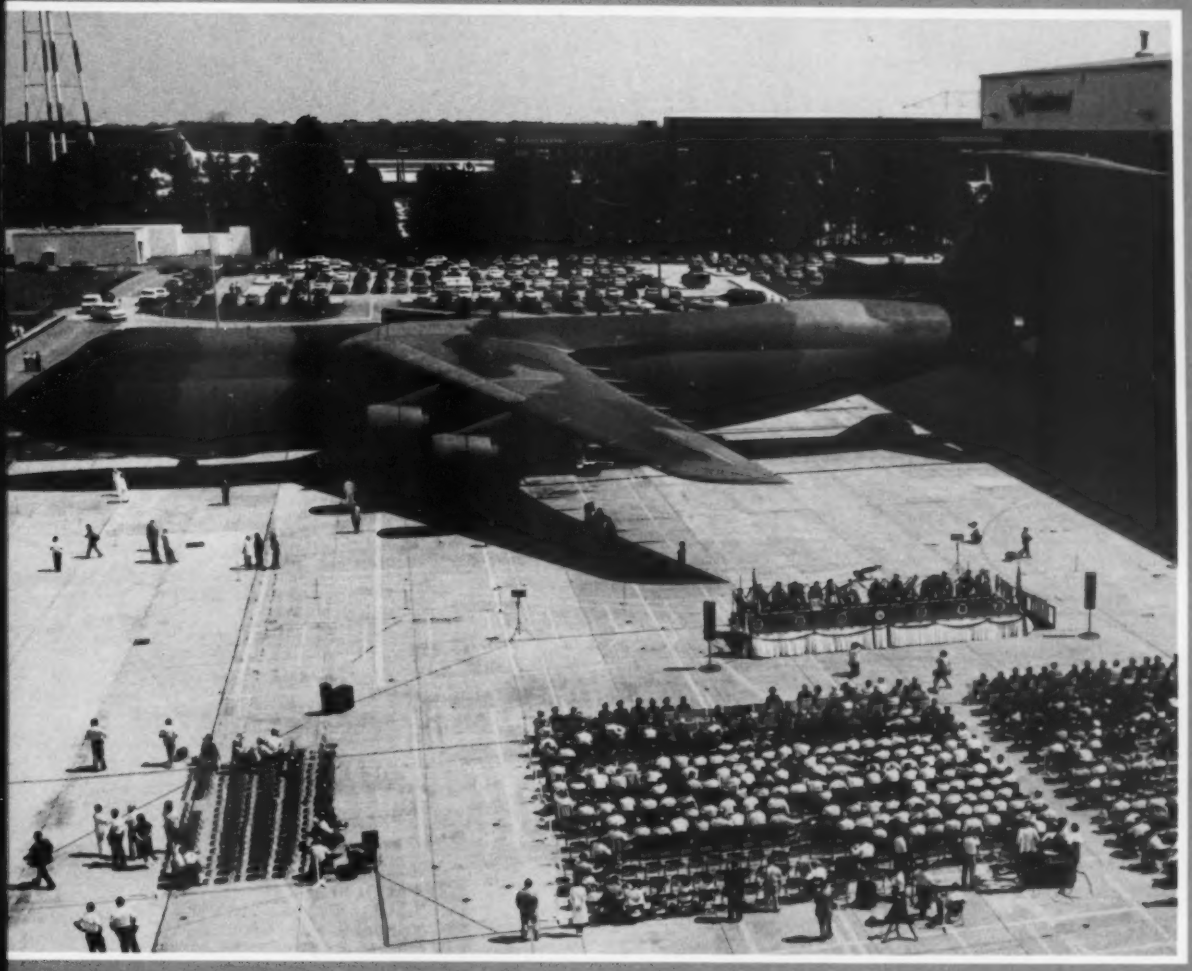
# THE MAC Flyer

SEPTEMBER 1985



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# THE MAC Flyer

For Greater Safety in MAC Air Operations

September 1985 MACRP 127-5 VOL XXXII NO. 9



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About the Cover—Lockheed rolls out the first C-5B, 12 July, at the Marietta, Georgia plant.

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# The CINC Bids Farewell

General Thomas M. Ryan, Jr., CINCMAC

I've always believed that the best job you're ever going to have is the one you have now, and being the commander of this great force—the Military Airlift Command—has been the best job of my career. What's made it the best is that I was able to serve with you outstanding men and women who fly and support our many missions around the world.

Our missions are demanding, and your professionalism has been MAC's greatest asset in keeping those missions on track. You've shown that you really do believe it's important to do things right, to do them by the book, and do them in such a way that the mission gets done and done safely.

Your efforts in Operation Urgent Fury also point out that MAC will have an ever-increasing importance in future conflicts, and that our primary mission is training for war. And the core of MAC's wartime mission is what you do as crewmembers. Keeping your focus on doing that well and doing it safely is your challenge for the future.

It's been great to serve as your commander. During my watch I've received congratulations and kudos from every level of leadership in our nation for the job you are doing. I want to take this opportunity to pass on those good words to you—the people who actually make it happen. I say goodbye knowing that you will serve as proudly for the future as you have done in the past.

*A look at the CINCMAC-directed . . .*

# C-130 Executive Review

During the 21 month period from June 1983 to March 1985, we destroyed or damaged seven MAC or MAC-gained C-130s. These seven aircraft mishaps claimed the lives of 51 people—a loss beyond value. Those mishaps represent a materiel loss totaling $34 million. All seven mishaps have some type of human error in common, and they serve as the basis for an in-depth study of ways to improve the efficiency of this command.

In early February of this year, Gen. Thomas M. Ryan, Jr., CINCMAC, directed an Executive Review of recent C-130 Class A mishaps, with emphasis on operator error and human factors. The purpose was to take a "no holds barred" approach to identifying common problems and to propose solutions which will reverse the increasing percentage of people-error-caused mishaps. Analysis of the seven safety investigation reports revealed five common problem areas—Crew Coordination, Basic Flying Skills, Air Discipline, Human Factors, and Supervision. One problem was involved in all seven mishaps—inadequate crew coordination. This was manifested primarily in the reluctance of other crewmembers to call the pilot's attention to significant deviations. All but one of the mishaps involved a deterioration in basic flying skills. A degradation in air discipline was common to five of the seven. In the area noted as human factors, three points were predominant: task saturation, loss of situational awareness and selective inattention to detail. Finally, failure in *unit* or *cockpit* supervision contributed to all of the mishaps.

After identifying the common areas, the Executive Review turned next to identifying solutions. In February, Lt. Gen. Robert F. Coverdale, MAC Vice Commander-in-Chief, solicited the ideas and recommendations of all C-130 unit commanders on ways to prevent human error mishaps. In his message, he stated, "We want to know what you and your units have implemented to prevent aircrew human error mishaps. Do you have a program we can use command wide?" The idea was to encourage each commander to take a critical look at every facet of his flying operation with an eye to finding fixes MAC could implement. By identifying the areas with problems, and the areas with good fixes already in place, we hoped to improve the aggregate effort to prevent mishaps.

For background, the commanders were provided a summary of the last ten years' C-130 Class A mishaps. The effort yielded responses from 20 commanders from MAC

by Captain Donald L. Rosenberry
Associate Editor

Numbered Air Forces, Wings, Air Force Reserve and Air National Guard units. There were some philosophical responses and some specific recommendations.

After all the inputs were in, representatives from MAC Operations, Personnel, Flight Surgeon and Flight Safety discussed and analyzed these inputs, then they organized a unit-level working group meeting. This working group included 15 experts from MAC operational units, Air Force Reserves, Air National Guard, the Air Force Safety and Inspection Center, and the USAF School of Aerospace Medicine. There were squadron commanders, aircraft commanders, ops officers, evaluators, instructors, and flight safety officers—a representative grass roots group doing the flying mission right now. The unit-level working groups developed and proposed 78 recommendations, which included those previously received from the unit commanders.

The next step reduced the original 78 recommendations to 22 by consolidating or eliminating those which were impractical, unfeasible or already implemented. These 22 were then presented at the MAC directorate level, where the directors further reduced the list to 13, each related to the five originally identified problem areas. Those directly related to aircraft operation and crewmember performance made up one category, while those which didn't directly relate to flying but did impact crewmember performance made up a second category.

1. INCREASE THE QUALITY AND QUANTITY OF CREW COORDINATION TRAINING IN THE FORMAL SCHOOL AND CONTINUATION TRAINING PROGRAMS THREE WAYS:

A. INCLUDE ALL CREW POSITIONS IN THE CREW COORDINATION SEMINAR FOR AIRCRAFT COMMANDERS IN PHASE I TRAINING. EMPHASIZE CREW LEADERSHIP/FOLLOWERSHIP, SITUATIONAL AWARENESS, AND TASK SATURATION.

B. IMPLEMENT COCKPIT RESOURCE MANAGEMENT TRAINING AS SOON AS POSSIBLE.

C. FUND MODEL AIRCREW TRAINING SYSTEM IMPLEMENTATION.

The first recommendation aims at improving the crew coordination, air discipline, human factors and supervision problem areas. The status of this three-part recommendation follows:

1a. In July 1985, the C-130 formal school curriculum was changed to provide time for teaching crew coordination, the hazards of low-level flight, channelized attention, task saturation and air discipline. Time will be set aside during mission and simulator briefings or debriefings, specifically to address these areas.

1b. HQ MAC Training representatives attended a meeting for the development of a C-5 Cockpit Leadership Management (CLM) program in July. The generic portions of that program should be directly transferable to C-130 training, with specific portions tailored either by contract or DOT working group. The target start date for C-130 CLM program development is January 1986, followed by implementation in February 1986.

1c. The Aircrew Training System (ATS) is a new training concept. In effect, the system will "modernize" MAC's approach to training, and should be on line in FY 88.

2. IMPROVE BASIC FLYING SKILLS BY ADDING GROUND IDLE TOUCH AND GO LANDINGS, SLOW FLIGHT AND STEEP TURNS TO FORMAL SCHOOL AND UNIT LEVEL TRAINING PROGRAMS.

3. IMPROVE BASIC FLYING SKILLS BY ADDING APPROACH TO STALL TRAINING IN THE AIRCRAFT FOR ALL PILOTS AT THE UNIT LEVEL.

4. ESTABLISH A FLIGHT EVALUATION DURING PHASE II UPGRADE TRAINING PRIOR TO ALLOWING THE STUDENT AC AND STUDENT COPILOT TO FLY WITHOUT AN INSTRUCTOR IN EITHER SEAT.

5. ELIMINATE SQUADRON STAN/EVAL AND PLACE ALL FLIGHT EXAMINERS IN ONE WING STAN/EVAL DIVISION.

6. DEVELOP AND ENFORCE OBJECTIVE STANDARDS OF PERFORMANCE FOR EXAMINERS TO USE ON FLIGHT EVALUATIONS.

7. ADMINISTER ASETS WITHOUT PRIOR NOTICE AND MAKE EXAMS MORE COMPREHENSIVE.

8. SUBMIT A SON FOR HUMAN FACTORS RESEARCH AND APPLICATION, A CREW AWARENESS PROGRAM, AND HUMAN FACTORS SPECIALIST TRAINING.

9. RESTRUCTURE STUDENT PIPELINE SO RECENT UPT/UNT GRADUATES PROCEED DIRECTLY FROM PHASE I/PHASE II TRAINING TO THEIR OPERATIONAL UNITS.

10. ELIMINATE UNNECESSARY GROUND TRAINING CURRENCY REQUIREMENTS.

11. INVOLVE UNIT FLIGHT SURGEONS MORE DEEPLY IN THE FLYING ACTIVITIES AND ENSURE THEY ARE FAMILIAR WITH THE FULL SPECTRUM OF THE UNIT MISSION.

12. REVIEW SQUADRON COMMANDER AND OPERATIONS OFFICER SELECTION CRITERIA AND REQUIRE CREDIBLE, RECENT FLIGHT EXPERIENCE IN THE WEAPON SYSTEM.

13. EMPHASIZE AND SUPPORT THE PRIMACY OF FLYING IN A CREWMEMBER'S CAREER PROGRESSION.

14. EXCEPT WHERE IMPRACTICAL, ALL MAC CREWMEMBERS SHOULD WEAR NOMEX FLIGHT GLOVES DURING CRITICAL PHASES OF FLIGHT, I.E., TAKEOFFS, LANDINGS AND LOW-LEVEL FLIGHT.

Recommendations 2 and 3 aim at improving basic flying skills by adding ground idle touch-and-go landings, slow flight, steep turns and approach-to-stall training to formal school and unit level programs. HQ MAC Standardization began the pyramid checkout process at Little Rock in May 1985. A HQ MAC/DO message to the field contained guidance to implement training in the other areas. The estimated completion date for initial training for *all* active duty C-130 pilots is 31 Dec 85.

Recommendations 4, 5 and 6 address the air discipline and supervisory problem areas. The recommendation to add a flight evaluation to Phase II upgrade training before allowing a student AC and copilot to fly together without an instructor in the seat is under review. HQ MAC Training transmitted a message changing the "Critical Phases of Flight" paragraph in MACR 51-130. It now requires the instructor to be in the seat from prior to the slowdown maneuver until after DZ escape. Unit commanders discussed the recommendation to eliminate squadron level stan-eval during VOLANT RALLY. C-130 commanders favored the idea while most others did not. The members of the subsequent C-130 worldwide stan-eval conference unanimously agreed on wing consolidation. HQ MAC Standardization sent a policy message directing consolidation for active duty tactical airlift units by 1 September 1985. Addressing the recommendation to develop and enforce objective standards of performance, MAC Standardization has drafted the standards which will appear in the next revision to MACR 60-1.

Recommendation 7 suggests ASETs be administered without prior notice and annual flight crew proficiency examinations be made more comprehensive, and aims at improving the supervision problem area. The change in the written examinations was implemented in February, expanding them from 25 to 40 questions, adding fill-in-the-blank type questions, and increasing minimum passing from 80% to 85%. However, regarding the first part of the recommendation, the consensus at HQ MAC is that no-notice ASETs just won't work.

Recommendation 8 sets out to increase our knowledge of the human factor in mishaps to improve crewmember activity. A Statement of Need (SON) will identify the requirement formally and is in draft. It should be through the coordination process in November 1985.

The remaining five recommendations affect flying indirectly through crewmember performance.

Recommendation 9 suggests we set up personnel training to allow earlier reinforcement of Phase I and Phase II training in the unit by ensuring UPT/UNT students go directly from RTU to the unit. This required restructuring the student pipeline so officers will complete survival school *before* formal C-130 training. By 1 January 1986, a change to AFR 50-5 will make survival school a prerequisite for C-130 pilot and navigator formal schools.

Recommendation 10 addresses ground training currency requirements. HQ MAC Training is conducting an in-depth review of the ground training currency requirements and is studying suggested changes or deletions.

Recommendation 11 aims at creating a greater understanding of the flying mission by our flight surgeons as a part of the solution to the human factors problem area. The command surgeon began a C-130 "immersion" program entailing 60 flight hours in 35 days for flight surgeons. The immersion flight period ended in June. The HQ MAC Surgeon will use physician reports to revise, if necessary, the flight surgeon role.

Recommendation 12 relates to supervision and is directed at ensuring squadron commanders and their operations officers are current in unit aircraft *prior* to assuming their positions. Commanders and operations officers are now required to be fully mission qualified and, where applicable, lead qualified before assuming their duties.

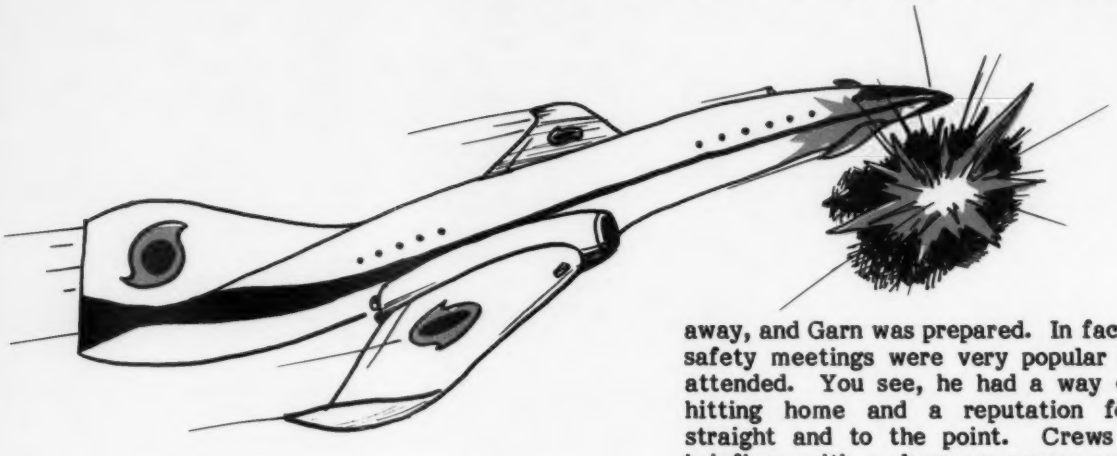
Recommendation 13 addresses the basic flying skills area, with the concept that treating flying as the primary concern in a crewmember's career will emphasize the importance of proficiency. This was a topic of discussion at VOLANT RALLY, and General Ryan stressed this issue in the CINCMAC video tape to aircrews.

These thirteen recommendations were presented to General Ryan and he added a fourteenth recommendation applicable to all MAC crewmembers—the wear of nomex flight goves. The purpose for wearing nomex flight gear is protection. Given the obvious importance of being able to use your hands in the event of fire or other emergency, wearing the nomex flight gloves with the nomex flight suit is quite logical. HQ MAC Standardization evaluated flight glove use on all MAC aircraft and found the existing procedures adequate. The next change to MACR 55-130 will require tactical airlift crews to wear gloves during airdrop from slowdown through escape in addition to those times already required.

General Ryan directed the Executive Review to pinpoint common human factors problem areas and do something about them. The recommendations that surfaced in the final analysis provide a basis for MAC to take some positive action in the prevention of mishaps. We may never know how successful the review is in preventing another Class A C-130 mishap. One simply can't prove that any specific action prevented a mishap; there's no way to know since the mishap doesn't happen. This Review and the recommended solutions it created are the result of MAC people working together. The critical attitude spawned in the effort of self-inspection, seeking weak points and strong points alike, may well be equally as valuable. If we take a few moments now and then to ask the questions, "What am I doing right?" and "What am I doing wrong?" and crosstell the answers, we are increasing the efficiency of the command. We may prevent others from making the same errors we made, and perhaps we can prevent a repeated loss of lives and hardware.

Different time, different place, but the same old lessons.

# Universal Applications



by Captain Clifton L. Bray, Jr.
41 MAS
Charleston AFB, South Carolina

The War, as it is now called, lasted 26 months. The exact cause is still debated by the historians; the winner debated by politicians. To the astonishment of many, the conflict didn't escalate to the strategic nuclear level as so many theorists had predicted. Instead, the "star wars" defenses deterred both sides from using their vast ICBM forces. One fact not debated was that the war was an economic disaster for both sides. The cost was astronomical and will be felt for generations. Since the war had no winner, both sides are now rebuilding their forces.

The war was not on Uri Garn's mind, though. Instead, he was thinking about the future. His safety meeting was an hour away, and Garn was prepared. In fact, Garn's safety meetings were very popular and well attended. You see, he had a way of really hitting home and a reputation for being straight and to the point. Crews left his briefings with a deep awareness and understanding of safety.

Garn was also known for his unorthodox style. Several months ago he presented a show called "Real People" consisting of slides of families. The first slides were taken long ago. The clothes and surroundings betrayed this fact. As the slides progressed in rapid succession (there were over 500), the clothes changed and it became evident the sequence was progressing to the present. Suddenly, the audience recognized several of the adults. They were crewmembers killed in recent accidents! The presentation ended with Garn asking, "Who were these people?"

One lieutenant replied, "The last few slides were of the crewmembers killed in the accident last summer."

"That's right," said Garn.

"But what about the war," asked another. "I didn't see anyone killed in the war."

"That's also right," replied Garn, "because these were crewmembers killed in peacetime accidents. What you saw today was only 10 percent of the fatalities of the past fifty years." After looking at over 500 slides, 10 percent seemed unbelievable! Where did Garn get them all? This was the stuff Garn's

Third Place Winner, 1985 MAC Flight Safety Writing Contest

safety meetings were made of. *No one* walked out of that room feeling immortal.

Garn rested his feet on the badly chipped gray desk and closed his eyes. Five minutes passed before he opened them. He had been concerned about today's subject, but now he knew he must say some things, as unpopular as they might be. One thing was certain. Today's presentation applied to all crewmembers—universal application for everyone.

Garn got up and walked over to the window. He was taller than most and his flight suit legs fit high around his boots. The sleeves were also too short and he kept them pulled up and fastened with velcro around his biceps. The pushed-up sleeves revealed a long jagged scar from above his elbow, down his forearm, and across his hand. Garn received the scar while inserting an assault team 500 miles beyond the forward line of enemy forces. During takeoff, a fragmentation rocket exploded outside the cockpit on the right side of the aircraft, instantly killing his copilot. Garn's side was hit with shrapnel, but he continued the takeoff and recovered the aircraft after a two-hour low-level route. Garn's story wasn't unusual; most of the 41st Special Operations Squadron personnel had had similar experiences.

Garn pulled his sleeves down, gathered his notes, and began walking to the theater to give his "presentation."

Out on the flightline, an MC-181 crew ran through the checklist.
"Chaff and Flares - Disarmed."
"TF/TA Radar - Off."
"Primary CRTs - Off."
"Power Grids One through Six - Off."
"Heads-up displays - Off."
"INS 1, 2 and 3 - Off."
"Laser Generators 1, 4 and 8 - De-energized."
"SatCom Links - Disabled."
"Radios and IFF - Off, Codes Removed."
"Before leaving aircraft check, complete."

The copilot hit the rewind button on the computerized scroll checklist. Her eyes glanced quickly at her instructor, then back to the checklist CRT. Perspiration glistened on her brow.

Kerr Glassar, the instructor, was sweating, too. He pulled off his headset and placed it on the side console. He gazed out of the cockpit window for a few seconds as if pondering some massive philosophical question, then grabbed the headset and turned to get out of the seat. As he did, his eyes met those of the flight engineer. Their stare lasted only a moment, but said silently what aviators have said for over 100 years. It was the look of, "I'm glad we're back safely on the ground because this time it was close, really close . . ." Who would have suspected a hydraulic failure would prevent gear extension on the last approach, resulting in a go-around and entering holding with only 15 minutes of fuel.

Fortunately, there was no gear-up landing. The engineers manually extended the gear on final approach and they made it down with five minutes of fuel left.

Glassar's eyes broke contact with the engineer's. "Hey, we've got twenty minutes to make Garn's safety meeting. Let's hustle. I want a good seat."

Glassar slid down the crew entrance ladder of the MC-181 and walked quickly towards the crew tram. The copilot and engineer followed silently, passing beneath the huge cobalt dilithium turbines, still winding down from an incredible RPM.

Garn looked out over the audience and began his spiel. "Today I want to talk to you about changing times—changing times and changing responsibilities. As you are aware, the war took a terrible toll on our economy. We see the effects daily. Now we're rebuilding our forces, hoping to maintain a strength that will prevent further aggression. But reaching that strength is costing our country a tremendous amount of money at a time many feel we can't afford it. I'm going to say a few things concerning our responsibilities as crewmembers during the years ahead." Garn paused for a moment. "How many of you realize that every time you take off, you're responsible for a national asset? Do you know the cost of one of our MC-181s? It's around $75 million. That figure may be hard to grasp so I'll give you an example of its value. Let's suppose you were approached by someone with a job offer. This job paid pretty good too—one dollar per second. Not bad?" Garn could see some people going through mental gymnastics. "That's $3,600 *an hour*. If you worked 40 hours a week and saved every cent you earned, it would take you *ten years* to save enough to buy one

MC-181. One crashed MC-181 equals $75 million lost!

"Quite a loss of property don't you agree? It's really quite impressive, and indicative of the magnitude of trust society places on you on every flight. The public expects you to return its aircraft in good condition. In fact, there are few jobs where the negligence of one person can cost his company the amount any one of us can. Sure, there are company executives and politicians who deal with large sums of money, but they are never in a position where in the blink of an eye, due to a momentary lapse of attention at a critical time, they can loose *$75 million.*

"You may be wondering why I didn't say a crewmember's negligence can cost him his life and perhaps the lives of several hundred passengers. Well, we harp on that enough. Safety isn't just worrying about loss of life." Now comes the unpopular part, thought Garn. He knew a lot of people would criticize him for his upcoming words, but he was going to be honest. What more could anyone expect?

"The loss of life is important. No one wants to lose a father, a daughter or a friend in a mishap. But sadness is cheap and doesn't cost the country in terms of hard cash. However, the loss of a trained aircrew does. In fact, the average aircrew costs around $2 million. So, you can add to the cost of an MC-181 crash another $2 million, plus the training cost of any troops that may be on board. The average A-Team costs a million dollars." Garn could see people getting uneasy.

"Let's forget about the emotional end of a mishap and look at it in a cold, bookkeeping sort of way. If you," Garn pointed to the audience, "negligently crash an MC-181, you've cost your country a lot of money. So much, in fact, it has significantly reduced our ability to maintain an adequate defense. You've blown the trust everyone put in you. We pride ourselves on serving our country. Well, if you cost your country $75 million, the country would actually be better off if you had just stayed out of the flying profession to begin with.

"Preventing loss of life is a big part of our jobs and I take it very seriously. But preserving the aircraft we have is also our job. The hard truth is that crewmembers are easier and cheaper to replace than aircraft. That was never true before. In earlier times a transport aircraft could be produced in a few months at a cost of around $1 million. Today, it takes *fifteen* years to develop and produce a weapons system like the MC-181 and the cost is almost 75 times as much. Let me assure you, it's not just inflation. A plane costing $1 million fifty years ago should only cost $5 million today due to inflation. The real cost is in the added capability, the high tech equipment necessary to produce it. That's why they built planes by the thousands whereas now we only make a few hundred of one type. Times have changed, and so have your responsibilities. Years ago, a crewmember was definitely responsible for an expensive piece of hardware, but nothing like today. Sometimes, we think we have the right to take 'calculated risks.' After all, if we're wrong, we pay with our lives. Today, that doesn't cut it.

"We don't have the right to risk an asset costing so much. Many times we take risks and push things too far because we're confident we can hack it. Well, that's a gamble your country doesn't want you taking with its money."

Garn paused. A lot of people were thinking, remembering instances where they made a "can do" decision that maybe pushed too far. On the second row, Kerr Glassar sat with his head back, looking at the ceiling. He dropped his head and looked into his cupped hands. The copilot and engineer sitting next to him were looking at each other. The engineer looked at Glassar, took a deep breath, then looked down at the floor.

Garn continued, reinforcing his philosophy with examples: The crew who takes an aircraft with a maintenance problem because they're confident nothing will happen and they want to move the mission; a crew that penetrates a line of thunderstorms to save time; a crew that attempts an aerial refueling in marginal weather because they're on a "high visibility mission."

"All of these are gambles. You've heard it before. No peacetime mission is important enough to risk loss of life or aircraft. Let's use good judgment and save the aircraft and aircrew for a potential conflict. We'll need them."

Garn moved off stage, gathered his notes, and walked out of the theater. He was satisfied. If a few people misunderstood his views, so what.

# Flying Hour Milestones

## 10,000

Lt Col Charles F. Haberlen, 3 MAS
Lt Col James G. Jeter, 20 MAS

## 5,000

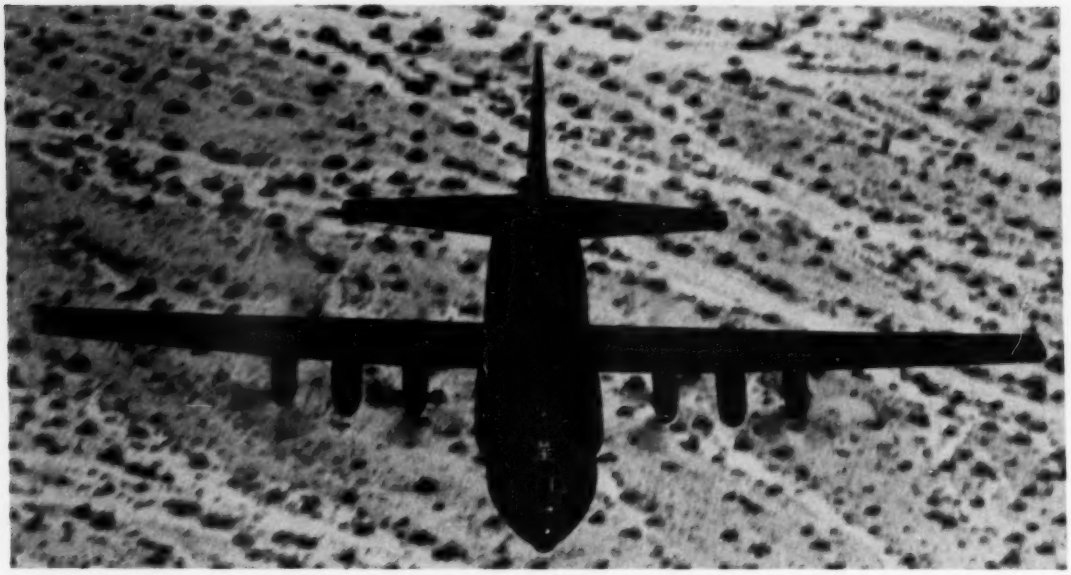
Col Charles W. Driggers, Jr, 181 TAS
Col Douglas M. Wendt, 39 ARRW
Lt Col Richard P. Dougherty, 16 SOS
Lt Col William A. Gericke, 16 SOS
Lt Col Duane L. Kratz, 181 TAS
Lt Col Joe E. Lindsay, 3 MAS
Lt Col James W. Piercy, 130 TAS
Lt Col William E. Platt, 20 MAS
Lt Col William R. Terry, 16 SOS
Lt Col Gifford G. Tures, Jr, 403 RWRW
Lt Col Paul C. Wonderly, 16 SOS
Lt Col Roland D. Wurstner, 16 SOS
Maj James E. Albin, 86 MAS
Maj James M. Bennes, 16 SOS
Maj Rollin C. Broughton, Jr, 62 TAS
Maj William J. Brown, 3 MAS
Maj Wayne W. Galvani, 403 RWRW
Maj Anthony M. Hotsko, 16 SOS
Maj Hugh D. McGarity, 16 SOS
Maj Louis V. Ryan, Jr, 403 RWRW
Maj Richard W. Standish, 9 MAS
Maj Jackie W. Vaughn, 181 TAS
Capt Roger K. Devore, 7 MAS
Capt Robert G. Iddings, 130 TAS
Capt Steven J. Malone, 16 SOS
CMSgt Sherman E. Eller, 16 SOS
SMSgt James P. Denney, 3 MAS
SMSgt Richard L. Hall, 16 SOS
SMSgt Keith E. Rodekohr, 187 TAS
MSgt Mitchell Brown, 16 SOS
MSgt Roger Capps, 16 SOS

Ranks and units are those at time of award. See MACR 900-3 for details on how to apply for your own milestone award.

Garn felt warm. He glanced at the thermometer outside the theater foyer. Today was hot. Almost 120 degrees outside and not yet noon. He went inside the theater restroom, pushed up his sleeves and rinsed his hands and face. Bending over the sink, he dried his hands and gazed at the scar on his third arm. The jagged line cut deep into the thick green scales, spoiling their symmetrical pattern. He straightened up. Garn was tall, almost fourteen feet, putting him a good two inches above the next tallest squadron member. He peered into the mirror. His purple eyes showed a confident look, one of a proud being. You see, Garn was not a man at all, but a member of an entirely different order of life. Although the laws of physics would never allow him to meet his human counterparts some 18 billion light years away, his philosophy spanned the galaxies and had universal application to all nations striving for a strong defense, and to all beings who assume the challenge and *responsibility* of military aviation.

A graduate of Texas Tech, Captain Bray completed UPT at Reese AFB in 1978. After a tour flying C-141s at Charleston AFB, he was assigned to the Special Operations Division, HQ MAC/DOX. Having just completed a tour at the Pentagon, where he was an action officer in Programs and Requirements, Captain Bray is back flying C-141s at Charleston. He is currently assigned to the 41 MAS serving as chief of combat tactics.

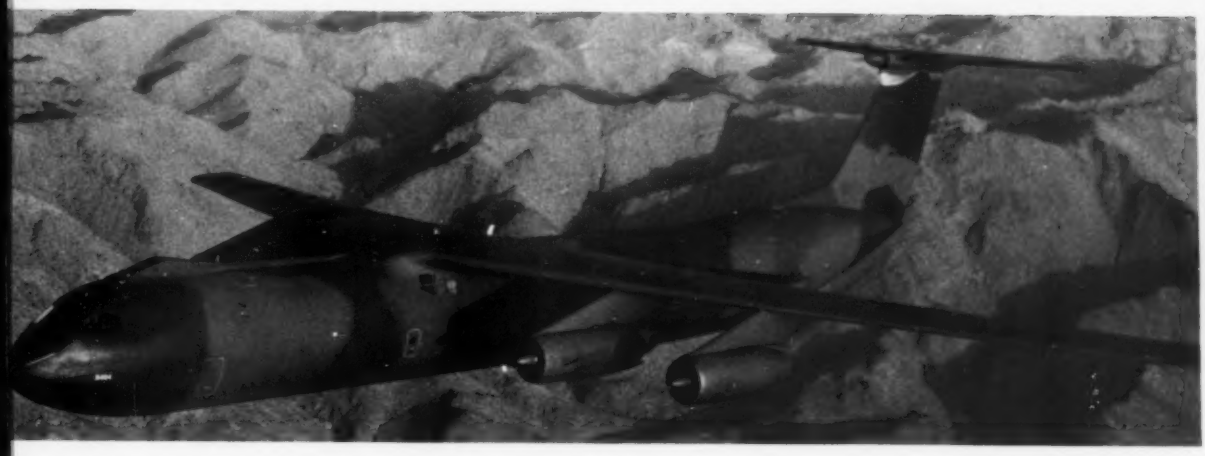
# Resource Management in the



by Dr. John Lauber
Chief, Aeronautical Human Factors Research Offices
NASA Ames Research Center
Moffett Field, California

Recent innovations in aircraft technology have far-reaching implications for cockpit resource management. Microprocessors and cathode ray tube (CRT) displays greatly affect how the flight crew—the ones responsible for safe, efficient operation of the aircraft—do their jobs. Examining the implications of advancing technology on cockpit resource management reveals important lessons about how the crewmembers' jobs are affected, not just in new-technology aircraft, but also in earlier ones as well. Crewmembers should practice good resource management in every aircraft, regardless of its level of technological sophistication.

The term "cockpit resource management" refers to using all available resources—information, equipment, and people—to achieve safe and efficient flight operations. My colleagues at the NASA Ames Research



Center and I became interested in the topic several years ago when we began looking at human factors in aviation safety. After much research and many discussions with other scientists, line pilots, and others, we concluded that one of the principal causes of accidents was a failure by crewmembers to effectively use all of the resources available to them during flight operations. We also concluded that, in large part, this failure was due to *inadequate training in leadership, command, and cockpit management.* (Editor's emphasis.)

We became more confident in our early conclusions when our colleague, Dr. H. P. Ruffell Smith of NASA, conducted a study using a technique called "full-mission simulation." In his study of human error in flight operations, Ruffell Smith used a training simulator with a tightly scripted scenario very similar to those used in Line Oriented Flight Training (LOFT). We observed how 20 regular flight crews handled a simulated line trip from New York's John F. Kennedy Airport to London. An oil pressure problem forced the crew to shut down an engine. This in turn created a diversion problem for them—a problem compounded by a hydraulic system failure, poor weather, less than ideal air traffic control, and a simulated cabin crewmember who always seemed to pick exactly the wrong moment to bother the cockpit with requests for information or assistance. What happened in the simulator was remarkably similar to what we had found in our earlier studies of accidents and incidents. Crews with largely error-free performance practiced good cockpit resource management; crews whose performance involved many errors—some potentially catastrophic—failed to use readily available resources effectively.

Because the scenario involved a high gross weight takeoff, followed by engine shutdown with a subsequent diversion, the crew needed to dump fuel to reduce the aircraft's weight to maximum landing weight. As in actual line operations, this was a very busy period. In one case, after the captain decided to dump fuel, the captain and the first officer together calculated that 570,000 pounds was *the correct target weight. They reached the decision without consulting the flight engineer or any aircraft documentation.* The flight engineer then calculated a dump time of four minutes and 30 seconds, which the captain accepted without comment, even though it was approximately one-third the actual time required. Without prompting, the flight engineer recalculated the dump time to the nearly correct figure of 12 minutes.

Instead of dumping fuel for 12 minutes, however, the flight engineer stopped after only three minutes, perhaps because he reverted to his original, erroneous estimate, or because he misread the gross weight indicator. Not satisfied, he again started to

recalculate, but the failure of the number-three hydraulic system interrupted him.

During the next eight minutes, the flight engineer was subjected to a high workload. He then noticed that the gross weight was much too high and decided to refigure the fuel. During that time, he was interrupted further and did nothing more about the fuel until the captain, noticing the gross weight indicator at 647,000 pounds, decided to make an over gross weight landing. A minute and a half later, the flight engineer rechecked the fuel as part of the landing checklist and became concerned about the high landing weight. He spent about a minute rechecking his calculations and announced that the aircraft's gross weight computer must be in error. Two minutes later, the simulator landed at 172 knots with only 25 degrees of flaps, at a 1,000-fpm descent rate and 77,000 pounds over the correct weight, on a short, wet runway.

During the 32 minutes between the decision to dump fuel and the landing, the flight engineer was interrupted 15 times. Nine of the interruptions came directly or indirectly from the aircraft commander, four from the cabin crew, and two resulted from equipment problems. The FE was never able to complete and verify his fuel calculations and dump times without interruption. He became overloaded and his work became fragmented. The captain failed to recognize the situation and so did nothing to resolve it.

Although this crew violated all the principles of flight deck management, another crew in the same study performed in a particularly exemplary fashion. In large part, they performed so well because the captain used his available resources very effectively. For each abnormal or emergency situation, he would ensure that the appropriate person was flying the airplane, that someone was monitoring, and that someone else was also trying to diagnose the problem. He also ensured everyone knew the plan for conducting the operation. The captain would never permit one person to undertake a critical operation. When demands started to pile up on the crewmembers, especially on the flight engineer during the fuel dumping procedure, the captain stepped in to help set priorities and share the workload. Thus, the obnoxious cabin crewmember was told not to bother the cockpit with anything other than

emergency communications. Furthermore, the captain requested and received assistance from ATC so the crew was better able to sort out the problem. As a result of this civilian "aircraft commander's" ability to manage his cockpit duties, the entire crew handled the complex problem without error and with maximum safety.

These examples help illustrate the importance of good cockpit resource management. Although the examples described above are from a simulation study, many similarities exist between the simulator situations and real-life situations. It's also important to note that good CRM involves all crewmembers, not just the aircraft commander.

### Rules to Fly By

Here are seven "Principles of Good Cockpit Resource Management," as summarized in American Airlines' **Flight Deck.**

(1) **Appropriately delegating tasks and assigning responsibilities.** As mentioned earlier, this task is greatly simplified in many ways with a crew complement of two pilots. However, for the same reason, I believe that the importance of clearly delegating major task responsibilities, especially during abnormal situations or emergencies, is enhanced. Because of the potentially greater demand for in-the-cockpit, heads-down operations in any situation involving deviations from a prestored flight profile, maintaining an adequate flight path and monitoring traffic while the computers are being reprogrammed require explicit procedures. It's much too easy for both pilots to become engrossed in the manual data entry problem if they don't apply definite procedures. Similar logic applies to other situations, including diagnosing and correcting aircraft systems problems.

**(2) Establishing a logical order of priorities.** Because more real-time information, especially about aircraft performance, is available in new-technology cockpits, it's important to establish and maintain a clearly ordered set of priorities for handling both routine and nonroutine situations. In many ways, the new technology improves a pilot's ability to define priorities because of the enhanced quality of the information used to make decisions. Nonetheless, the importance of setting priorities on various demands upon your time and attention can't be overstressed. Based on the number of ASRS (NASA's Aviation Safety and Reporting System) reports of altitude or heading deviations during such periods, it's safe to say that new technology doesn't lessen the importance of maintaining a clear set of priorities.

**(3) Continuously monitoring and cross-checking essential instruments and systems.** High levels of automation in new cockpits may well make this requirement much more difficult, despite improvements in routine system monitoring by advanced caution, alert, and warning system (ACAWS). Cross-checking manual data entry into the flight management computer system definitely requires much closer attention. Based on experience with existing keyboard data entry systems, most notably INSs, this is clearly a potential source of significant errors. Procedures must be developed to allow effective cross-checking of manual data entry, especially in flight.

**(4) Assessing problems carefully and avoiding preoccupation with minor ones.** On the basis of accidents and incidents we've seen, a major problem exists in operations. Because of the great reliability of air transport aircraft and their systems, even minor events that have no implications for the continued safety of the flight can command undue attention from the crew.

**(5) Using all available data to conduct an operation.** Perhaps the best (or worst) example of inadequately using available data is the "wrong airport" landing—inadvertently landing at an airport near the destination airport. These landings are usually made from visual approaches in "severe clear" VMC weather during which the flight crew didn't bother to tune up, or even worse, to monitor the destination landing and navigation aids.

**(6) Communicating all plans and intentions among all the crewmembers clearly.** No fellow pilot will be able to keep you out of trouble if he or she is unaware of your intentions and plans. Clear communication effectively deters this kind of operational problem.

**(7) Assuring sound leadership by the pilot in command.** This is one principle that will probably remain unchanged whether you're flying the newest C-5 or C-20, or the oldest C-130 or C-123. We've seen in our research that the aircraft commander is the primary element in determining the atmosphere in the cockpit. The AC sets the tone of the operation and, largely through effective leadership, establishes the safety and efficiency of flight operations. Sound command and leadership by the aircraft commander, and effective "followership" by the rest of the crew, remain absolute requirements for safe flight operations.

### Seven Principles of Good Cockpit Resource Management

1. Appropriately delegating tasks and assigning responsibilities.
2. Establishing a logical order of priorities.
3. Continuously monitoring and cross-checking essential instruments and systems.
4. Assessing problems carefully and avoiding preoccupation with minor ones.
5. Using all available data to conduct an operation.
6. Communicating clearly among crewmembers all plans and intentions.
7. Assuring sound leadership by the aircraft commander.

—Adapted from *Air Line Pilot*

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**ABOUT THE AUTHOR**—A commercial multi-engine-licensed pilot with a B-727 type rating and a rotorcraft rating, Dr. John Lauber is chief of the Aeronautical Human Factors Research Offices at the NASA Ames Research Center. This article is an edited adaptation of a paper Dr. Lauber presented at the Air Line Pilot's Association air safety symposium, "Beyond Pilot Error."

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## Mishap With A Moral

To this crew, going bac

# Pressi

Almost all crews are motivated to complete their flight as scheduled; it's part of the job. In the majority of cases, the crew's training and experience combine to present a good decision tree for almost every type of circumstance that might happen. Unfortunately, the unchecked idiosyncrasies of a

back was worse than . . .

# ing On!

crewmember can alter the decision-making process with disastrous consequences. On October 11, 1983, the crew of Air Illinois Flight 710 experienced the results of allowing one man's drive to "press on" overwhelm logic.

At 2020 Central Daylight Time, Air Illinois 710, a Hawker Siddley 748-2A, departed Springfield, Illinois, for Carbondale, Illinois, 45 minutes away. On this last leg of the flight, there were seven passengers and three crewmembers on board. The captain assumed command duties after "deadheading" to Springfield, and found Flight 710 was already 45 minutes behind schedule. Weather conditions at Capitol Airport in Springfield included a measured ceiling at 2,800 feet and visibility of 6 miles. Southern Illinois Airport at Carbondale reported a ceiling of 2,000 feet and a visibility of one mile with thunderstorms and rainshowers in the vicinity. The flight was to be conducted in accordance with IFR procedures. Two minutes after takeoff, the crew informed departure control they had an electrical problem. The controller asked if they intended to return to Springfield, and the crew reported they did not. Less than a minute later, Flight 710 asked to remain as low as possible. They were cleared to maintain 3,000 ft, and the controller asked if he could provide any further assistance. The crew of Flight 710 replied, ". . . we're doing okay, thanks."

Shortly after this exchange, the first officer began a series of procedures directed at finding the problem. At one point he isolated the right generator from the center electrical bus bar. While the right generator continued to produce voltage, the first officer couldn't get it to accept the electrical load as it had also disconnected from the right bus bar. (Investigators couldn't determine why the right generator disconnected from the right generator bus bar as well as the center bus bar.) The left generator remained inoperative, later determined to

have sheared a drive shaft. His efforts completed, he told the captain, "the left side is totally dead, the right is putting out 27½ volts, but I can't get it to come on the line." At this time, Flight 710 was about 39 minutes from Southern Illinois Airport, but only 6 minutes from Capitol Airport. The captain elected to continue to Carbondale despite their difficulties.

At 2027, the captain contacted Kansas City ARTCC with an "unusual request." He requested a descent to 2,000 feet, "even if we have to go VFR." He also asked the controller to "keep an eye on us if you can." The controller reported 2,000 feet was below his "lowest usable altitude," and he felt that at that altitude they would be too low for radar contact. The flight continued at the assigned 3,000 feet. Throughout the rest of the flight, the captain and the first officer discussed the electrical system. While the first officer suggested various electrical configurations to conserve battery power, the captain rejected them all and the first officer did not dispute the decision not to reconfigure. At 2051, Flight 710 disappeared from the Kansas City controller's screen, and at the same time the first officer said, "I don't know if we have enough juice to get out of this (situation). We're losing everything, down to 13 volts."

A few minutes later, the captain asked the first officer, "Do you have any instruments? Do you have a horizon?"

The aircraft impacted the ground on a 340° heading just 24 miles short of its destination. The aircraft was totally destroyed and everybody on board died.

**Analysis**

The National Transportation Safety Board placed special emphasis on investigating the operational and human performance factors in this accident. The rationale for focusing on the human element, given a known mechanical malfunction, is logical based on the circumstances of the flight. The crew was aware within two minutes after takeoff that the weather at their destination for their time of arrival was expected to be below VFR minimums, that both of their generators were essentially useless, and that the estimated time enroute was 45 minutes. With the weather VFR at Capitol Airport, all the data would seem to suggest a decision to take it around the pattern, land and fix the problem. In this light, the captain's decision to press on to Southern Illinois Airport, and the first officer's acceptance of that decision seem to defy logic.

The Board concluded that by 2025 (five minutes after takeoff), the captain should have known he would have to rely solely on the aircraft batteries for electrical power. The Board also felt the captain knew there was little chance of flying to their destination airfield in VMC, or that he could land without using electrically-powered navigation aids. Consequently, the NTSB determined the captain's decision to continue the flight was a cause in the mishap.

So why would an experienced captain opt to continue such a flight? At 2025, two options were available to the crew of Flight 710: return to Springfield, or continue to Carbondale. The Board concluded that the pilot believed the aircraft was capable of reaching Carbondale, and that he was capable of flying it there safely. The Board also believed his evaluation of those capabilities was prejudiced by factors which led him to inadequately assess the dangers such a flight would entail.

Knowing he was dependent on the aircraft batteries for electrical power, the captain needed two pieces of information about the aircraft's DC electrical system. First, he needed to know the endurance of the batteries. Then, if he decided there was sufficient time to continue the flight to destination, he needed to know how to manage the electrical loads properly to conserve battery power. The Air Illinois aircraft operating manual states only that available battery time is dependent on "the state of charge of the batteries and the essential loads required for flight conditions." The pilots are taught in ground school that fully charged batteries will work for a minimum of 30 minutes if their total load is reduced to 70 amperes. The method for shedding excess electrical loads is contained in the emergency checklist for loss of both generators. However, the cockpit voice recorder (CVR) tape revealed the emergency checklist was not accomplished, nor was any action taken to reduce the electrical load to the 70-ampere level. Reconstructing actual aircraft electrical loads with the aid of the tape showed that with the proper load reduction, it *might* have

been possible to fly to Carbondale and land before the batteries were depleted. The NTSB concluded the captain and first officer were inadequately familiar with the electrical systems of the aircraft. This would not have caused the mishap though, as they had only to return to Springfield when the problem surfaced. This again asks the question of just why *did* they continue *that* flight at *that* time?

Interviews with other pilots who had flown with this captain revealed he had a powerful drive to remain on schedule. This desire was demonstrated in several ways. He had a tendency to be critical of ground personnel whom he perceived were delaying his flight. He would disable the aural overspeed warning horn to gain time during descent by exceeding the aircraft's maximum operating speed limitation. He would fly too close to or under thunderstorms to avoid time-consuming deviations from the planned flight path. The safety board could not find any evidence supporting management-induced pressures which would create this kind of drive. Fellow pilots felt he simply wanted to be "a good old boy to get the airplane in on time. . . . It was just his own idea."

The Safety Board concluded these actions demonstrated the captain's overconfidence in his own ability and knowledge. Consequently, his overconfidence led him to believe *he* could safely accept the risks involved in operating his aircraft outside the constraints of the company operating manual *and* the aircraft operating manuals. In discussing unsafe acts, the Board quoted D. Petersen in his book, *Safety Management, a Human Approach:*

> ". . .the unsafe act has been learned and is maintained because it has been (and continues to be) reinforced by satisfying events . . . The advantages to be gained may seem greater than the disadvantages. . . The unsafe act 'makes real sense' to the person, because it gives the employee personal satisfaction. . . The worker may perceive his unsafe act as having definite job-related advantages."

The Board could not discern any advantages the captain would have gained by his actions other than the satisfaction of his self-induced drive to maintain schedules. The pressure appeared to be self-created. The interviews with the captain's fellow pilots also revealed his strong desire to return to Carbondale (the captain's home) at the end of a flying day. One pilot said of the captain, "He hated to stay overnight in Springfield."

The NTSB concluded the captain's decision to continue to Carbondale was based on his reluctance to remain overnight in Springfield; his self-imposed determination to adhere to schedule; his demonstrated willingness to assume what he believed to be acceptable risks; and, in this case, a misplaced confidence in his knowledge of the airplane and his flying capabilities.

**Probable Cause**

The National Transportation Safety Board determined the probable cause of the accident was the captain's decision to continue the flight toward the more distant destination airport after the loss of DC electrical power from both airplane generators instead of returning to the nearby departure airport. The captain's decision was adversely affected by self-imposed psychological factors which led him to inadequately assess the airplane's battery endurance after the loss of generator power and the magnitude of the risks involved in continuing to the destination airport.

**Application to MAC**

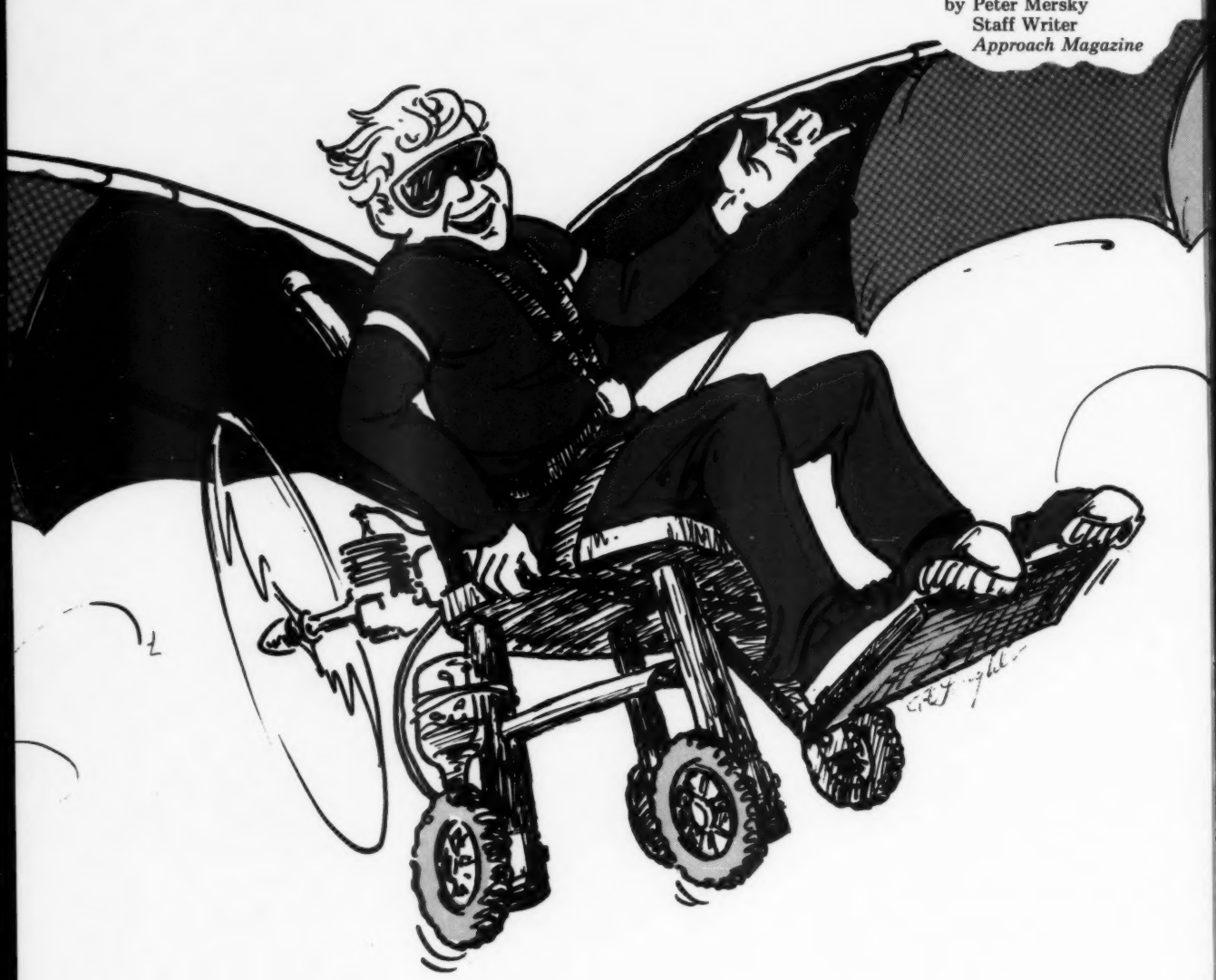
The tragedy of this mishap is magnified by the simplicity of preventing it. The captain of Flight 710 need only have landed after the loss of his generators. The reasons he didn't appear so trivial as to be unworthy of causing an aircraft accident. That may be exactly why the human factor in mishaps is so hard to pick out and prevent. It's the seemingly minor deviations from the checklist which end up being the most important of all. In most accidents, the causes are exactly as in this one, either so obviously wrong it defies all reasoning that they existed at all, or so seemingly innocent they "just couldn't" cause any real problems. Checklists and procedures, combined with solid leadership and active followership, are the most powerful defenses against human error in flight.

—Adapted from *NTSB/AAR-85/03*

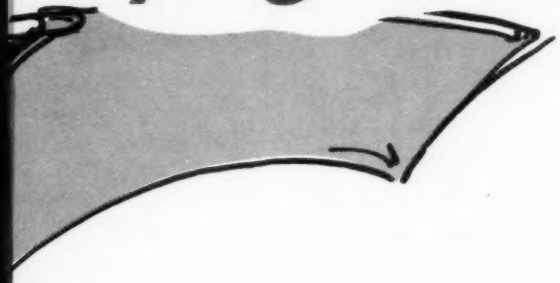
*Ultralights . . .*

# Those Hazardous

by Peter Mersky
Staff Writer
*Approach Magazine*



# Flying Chairs



My first exposure to the burgeoning world of ultralights came on a late summer's evening when the sun had nearly set and darkness was fast approaching. Working at my desk, I became aware of a curious buzzing outside the house which rapidly became louder, then faded away. This cycle occurred twice more before I went outside to find the source. To my surprise, I saw a small skeleton of an aircraft flying over neighboring houses less than 200 feet above the ground. I was infuriated that a pilot would operate his craft in such a hazardous manner and immediately called the local police.

While waiting for the police to respond, I observed the ultralight—for that is what it turned out to be—making several takeoffs from the baseball field across the street, during twilight, with people on the field. It was incredible! The only light came from the field floodlights. How could someone do something so stupid? Finally, a trooper appeared at my door to discuss the incident. He told me he had stopped the pilot and had issued him a ticket. To my further consternation, the officer also obliquely indicated that the pilot was something less than sober, although he wouldn't elaborate. All in all, a pretty scary evening.

I did some digging into ultralights the next day and found there was little or no regulation of these aircraft regarding their operation, *or*—incredible as it sounded—the licensing or instruction of their pilots. How could this be? I found it incomprehensible that such a situation could develop and flourish. But it did, and does.

Part 103.9 of the Federal Aviation Regulations (FARs)—the section directly pertaining to ultralights—declares, "No person may operate any ultralight in a manner that creates a hazard to other persons or property." Paragraph 103.11 addresses hours of operation for ultralights—30 minutes before official sunrise to 30 minutes after sunset. Other areas of Part 103 talk about the usual considerations: fuel, inspection and waiver criteria, as well as operation over congested areas. Sounds good. Then why is it, with all this formalized control, some ultralight pilots—and they *are* pilots in that they operate an aircraft—seem to disregard not only the established rules, but common sense? Certainly, the individual I encountered was on the borderline of safe operation. Let's also mention his "safe" operation over congested areas, because people were on the ground below him. If he were inebriated, the greater the transgression.

Other aircraft are covered in the FARs, which detail licensing, experience and currency requirements. Total hours, date of last flight in type aircraft and medical considerations are all taken into account. No such coverage is given the

ultralight community, even though interest in and operation of ultralights have skyrocketed in the last three years.

Perhaps the greatest area of conflict with ultralights is the matter of coexistence with the rest of the aeronautical community, and nowhere is the question of sharing the skies more sharply defined than around airports. Near mid-air collisions (NMACs) involving powered military and civilian aircraft of all types—fighters, cargo, helicopter, airliners and light planes—including ultralights, have appeared in messages with frightening regularity. Ultralights and other light aircraft inadvertently enter GCA patterns and fly across final approach courses without realizing the possible consequences.

As far as the military's involvement is concerned, a number of ultralight operating airports are located close to Navy, Air Force, and Army airfields. Ultralight "air parks" in the Memphis and Dallas areas are but two locations where it's best to keep all your Mark 1 eyeballs outside the cockpit and scanning the surrounding skies.

One of the more unfortunate aspects of ultralights is the lack of construction standards, especially relating to kits which the home builder purchases, builds in his basement or garage, and then carries it to the nearest field to fly. Many crashes involving ultralights were directly traced to a lack of proper building instructions or warnings. For instance, a fatal crash occurred because the ultralight's rudder and elevators locked, forcing the craft into a downward spiral from which recovery was impossible. The surfaces locked because there wasn't enough clearance between a fuselage spar and the surfaces which the builder failed to properly seat when building the kit.

Standards of flight instruction also vary considerably. Some dealers require purchasers of their ultralights to take elementary instruction from properly rated pilots. That's a start. Others require no such instruction and the neophyte ultralight owner/pilot can just jump in, start the engine (you can do it in this sequence in some ultralights), taxi around a bit, and take off. The image that comes to mind is one of flight training in France during World War I when the *ab initio* trainee spent hours taxiing a clipped-wing Bleriot on the ground to get the feel of his aircraft before attempting flight.

As pleasurable an experience as flying is, it can be dangerous. Within the two-month period of July to August, 1984, ultralights were involved in *13* serious accidents, some fatal. Look at the partial list of circumstances and results:

- An ultralight crashed on takeoff when a worn ignition wire grounded on the airframe. The pilot was seriously injured.
- Another incident occurred when an ultralight's wings collapsed. The pilot was killed.
- An ultralight collided with a lamp post. The pilot was seriously injured.
- The wings of an ultralight folded while in flight, causing the ultralight to go into a spin. The pilot was killed.
- An ultralight flew into some high-voltage power lines and crashed during descent. The pilot was seriously injured.

According to the National Transportation Safety Board, exactly one-half of the 166 reported mishaps involving ultralights reported during the 20-month period ending in August 1984 resulted in *at least one fatal injury.* That's 83 people dead and 73 seriously injured!

Now, with all this said, if you feel that you still want to enter the arena of ultralights, you might want to write the Aircraft Owners and Pilots Association for some hand literature on the subject. Write: AOPA, Air Safety Foundation, Ultralight Programs, 421 Aviation Way, Frederick, Maryland, 21701.

Finally, don't get me wrong. Treated with the respect they deserve, ultralights can be a rewarding and enjoyable way to relax in your spare time. But just as with motorcycles or hot rods or weekend competition racing, you've got to go about building and learning to fly ultralights with a totally "heads up" attitude.

—Adapted from the Navy's *Approach*

# What's a P-T-U?

**There's more here than meets the eye.**

by 1st. Lt. Donald A. Diesel
Mather Hospital
Mather AFB, California

All crewmembers, whether pilots, navs, engineers, loadmasters, flight nurses, etc., share a common experience early in their careers. If you want to "slip the surly bonds," this experience is one which can't be avoided. Not only that, but as long as you fly you've got to repeat this training at regular intervals. Why should you want to avoid such a "wonderful" experience? Ascending to a pressure equivalent altitude of 35,000 feet in a little iron box can do weird and wonderful things to your body—things that rarely occur in the operational world. And just to make sure you don't forget how much fun you had the first time, the regs say you have to re-experience this sensation every three years.

The "chamber," as it's referred to by many, is more accurately called the Physiological Training Unit, or PTU. But one forgets what actually took place within its confines all too soon. Before you even entered the chamber, you received instruction in the physiological hazards of high altitude flying. Such topics as hypoxia, hyperventilation, decompression sickness, ear and sinus blocks, spatial disorientation, vision and more were covered by the experienced team of PTU professionals. All of that information and more has been proven life saving time and again. The concept is simple—prevention through education.

As a PTU training officer, I've scanned the audience and all too often detected expressions of disbelief, discontent and boredom among the students. Perhaps they're thinking, "Why do I have to undergo this indignity? I've been flying for years without a problem, and they're not going to tell me anything I don't already know. All I want to do is get this over with and go home." For the most part, crewmembers with this attitude may never have to use a majority of what was presented at the PTU. The vast majority of our graduates will never have to use what we taught them. An overwhelming number will never experience a rapid decompression or evolved gas disorder. The point here is that anything can happen and it could involve anyone, but *which* one? In an emergency, how you act and what you remember from our course might very well make the difference between life and death—yours or someone else's.

You can't always depend on the steel and aluminum cylinder you ride around in to maintain pressure when you're more than two or three miles up. A case in point involves a pilot whose aircraft suffered an oxygen regulator malfunction. The pilot never recognized his hypoxia symptoms. The second case is similar to the first. The pilot's oxygen hose came loose without his noticing it, but the pilot recognized his hypoxia symptoms and reacted promptly. The first incident ended in a fatal mishap, while the second one ended with a fairly uneventful emergency landing. One person kept his cool and used his training; the other will never have to suffer through another refresher course.

Emergency situations don't always allow time to think; the stress imposed on an individual may, at times, prevent proper logical responses. That's why we commit some logical responses to memory. For hypoxia, the procedure is:

1. "Gang load" the regulator.
2. Check your connections.
3. Maintain a normal rate and depth of breathing.
4. Descend below 10,000 feet.
5. Land ASAP.

What about hyperventilation? What should you do about it? How do you differentiate it from hypoxia? The answer is simple—you don't; so, follow the same procedure you would for hypoxia. What about decompression sickness? Again, get on 100 percent oxygen, descend, declare an emergency and land ASAP.

The stress of a physiological emergency could cause difficulty in distinguishing between symptoms of decompression sickness, hyperventilation and hypoxia. However, as you were taught at the PTU, the similarity in treatment eliminates the necessity for making any distinction. Physiological training instructors aren't only interested in preventing loss of lives and aircraft, but also in preserving your health. We also make recommendations about preserving your vision and protecting your hearing as part of the training.

All the vulnerabilities of man are highlighted in the flight environment. The weaknesses are known, yet still cause mishaps. Thus, we turn to identifying traits common to all people which can result in mishaps. The human factor is rapidly becoming an area of greater concern in flight mishap prevention. If a mishap cause is attributed to human error, the investigator must discover what caused a very competent person to suddenly err. There are certain stresses which tend to increase a crewmember's probability of making an error. Self-imposed or not, stresses can decrease your physiological tolerance to the flying environment. What many crewmembers fail to realize is the degrading effect that stress may have on mental ability. Self-imposed stresses decrease your attention span and make you more susceptible to distraction. Proper stress management becomes increasingly important with increasingly complex job requirements. The ability to manage self-imposed stresses may become even more difficult when coupled with physiological stresses such as smoking, fatigue, and poor nutrition, not to mention the excessive intake of drugs, whether they're prescription, over-the-counter, or illegal.

The PTU officer is a good source for information concerning diet, nutrition, weight control, physical training, and physiological stress factors. Put your aerospace physiologist to good use. He's there for more than just a "ride in the chamber."

# C.R. Terror

*". . . down Texas way, we seldom bazooka a man without at least giving him a last smoke. Ain't mannerly!"*

by Major William C. Anderson, USAF, (Ret)

*(Editor's Note*--Some years are better than others in certain respects, and 1957 was a vintage year for several things. Among them were two in particular—the 1957 Chevy and this 1957 "C.R. Terror." Remember, this was a different time and C.R. wasn't quite as educated or "liberated" about the "fairer" sex as he is now. But no offense is intended. The command was known as MATS—Military Air Transport Service, and you could still "borrow" an aircraft for the weekend if you were a desk-bound jock. This was also a time when the weatherpersons were developing new gear to help the operators get a better handle on coming through the "goo" a little safer. The safety message in this little ditty comes through "five by five.")

"Stand back! Lemme at him! I'll kill him! I'm gonna hang, draw, and quarter him! Sahelp me, his ugly haid will adorn my fireplace mantel ere night falls . . . ." Major C.R. Terror had blood in his eye and a bazooka over his shoulder as he burst into operations and headed for the weather section.

"Where is this vacuum-skulled pibal piddler who foists himself off onto a guileless public as a weatherman; this fiendish fouler of forecasts; this ghastly garbler of weather reports? There's gonna be *one* weatherman with an open mind in this man's Air Force because I'm going to open it with a three-inch hole from this bazooka shell . . . ."

Happily, at this point, about seven feet of Airdrome

Officer uncoiled from the stool behind the operations counter and, with a ham-like paw, seized the collar of our irate hero as he dashed by. Terror, pulling about 60 inches of manifold pressure, was suddenly startled to find that his ground speed had dropped to zero as his pumping legs fanned air a good six inches above terra firma.

"Ah say there, Major. Before you go ventilating our only weatherman on duty, let's chat about it fo' a minute. Down Texas way, we seldom bazooka a man without at least givin' him a last cigarette. Just ain't mannerly."

"Arrgh goffme," squeaked Terror through the collar that was strangling him to a natty blue color. The Texan deposited Terror in a chair and patiently waited for the Miffed Major's vocal cords to return to normal. In Terror's case, it didn't take long.

"Okay, Tex, here's the pitch. Clarence Darrow couldn't beat this case for justifiable homicide. Now get this picture. I've got a Gooney Bird, a weekend off, and a date in San Francisco with the most gorgeous filly who ever overflowed a bikini. She has eyes like a newborn doe, hair like spun gold, and a thirst for martinis that is equal only to my own—probably the finest compliment that can be paid to any woman. Now, got the picture?"

Tex wiped a fleck of drool from the corner of his lip and nodded appreciatively. Terror continued.

"Saturday morning I grabbed my knickers, golf clubs, and portable martini kit and headed for operations. I filed my clearance for Travis AFB and was told by the weather johnnies that the weather might deteriorate slightly, but was forecast to remain above GCA minimums—no problem to old C.R., the Gaucho of the Gauges.

"The flight was uneventful—well, I say uneventful. Actually, there was a slight tiff with a power line which somehow got tangled up in our tail wheel and plunged the city of Oakland into darkness for three hours, but that could have happened to anyone. Anyhow, at destination they were reporting 300 and one mile. Not too good, but still above GCA minimums and no problem to old C.R., Cuckold of Clocks.

"I made a beautiful GCA approach to the field. Passed

through 400, 300, and 200 feet. At this point, Long Suffering Sam, my copilot, casually mentioned between laps around his rosary that we were passing through GCA minimums, and it was still as black as the inside of Mrs. Murphy's cow. Suddenly, I was stabbed lightly in the derriere by someone's TV antenna, so we decided to go around.

"Three passes and five TV antennas later, we were still in the goo. No sweat for old Terror, Connoisseur of the Controlled Approach—but Sam's palms were beginning to perspire noticeably. Am I getting through to you, son?" Tex nodded emphatically and wiped little beads of sweat off his brow.

"I decided to use this newfangled UHF pilot-to-forecaster service, and try to find out whether the forecaster just hated pilots, or whether some wag had stolen the runway. I was successful in contacting him on my first try, and it was his remarks then that are primarily responsible for his untimely demise-to-be. He said that Travis has an 'obscured ceiling of 300 feet and visibility of one mile.' I knew then that this young man was either a chronic prevaricator, or else I had been letting down to the wrong field—a mistake impossible for old CRT, Gourmet of the GCA.

"Well, to wind up this Terror tale, we soon wearied of collecting TV antennas, so we proceeded to our alternate. That's my story. While 120 pounds of gorgeous, heaven-sent love-on-the-hoof languished around, hungry for romance, I spent the weekend 300 miles away in a dingy hotel room listening to L.S. Sam practice his bird imitations. And all because yonder weather type doesn't know how to read a ceilometer!"

"Why that dirty varmint!" expostulated the AO. "Let's get him!"

The poor weatherman couldn't help but overhear the plot on his life, but being a veteran in his field, had long ago learned to take such dire threats in stride. With a sigh, he lit a cigarette and faced the lynch mob.

"My last cigarette, gentlemen, before I go to the great beyond," said the cornered weatherman before his accusers could speak. "Before I meet my Maker, though, there's one thought I would like to leave with you gentlemen. It's about a little gem called Slant Range Visibility.

"Our sharp MATS jockeys know that if an obscured ceiling of 300 feet is reported, chances of becoming contact at that altitude are pretty good—if you're flying a helicopter and coming straight down. However, since the MATS Chief Pilot discourages this sort of approach in our conventional aircraft, we use the normal glide path approach and this means that an obscured ceiling estimate ain't worth a hoot in telling you when you will become contact. It's obvious that a pilot has to see much farther on a slant range, and thus whatever is obscuring the ceiling will obscure him twice as much.

"Furthermore, visibility in such a situation decreases aloft, so that a reported visibility on the ground is probably much better than what the pilot has, at say, 300 feet. When we gave you the weather here, Major, we emphasized that our ceiling was *obscured*. When you hear that word or *precipitation*, or *indefinite* when describing the ceiling, handle with care, and be prepared to execute a missed approach."

"Okay, but right now I'm gonna execute one each weatherman and . . . ."

"The AWS troops have long been aware of this problem, and their longhairs are coming up with some pretty fine equipment, not the least of which is the transmissometer-ceilometer. Nearly perfected, this little jewel combines several factors to come up with the height which the pilot can become contact with the ground, as well as contact with the approach lights and the runway threshold.

"Now, shoot if you must, this old bald head, but I will not have gone in vain if you just remember this little poem. Made it up myself.

"You may break out of a ceiling that's been *measured*, *reported*, or *estimated* with little or no strife; but beware of a ceiling *obscured*, *precipitous*, or *indefinite* if you don't want to make a widow out of your wife."

The roar of the bazooka was deafening!

"Major, maybe you all shouldn't a done it," said Tex remorsefully. "I think he may have had a point there."

"As a weatherman, I guess he was pretty sharp after all," admitted Terror, blowing smoke out of the bazooka barrel. "But it's that poem that did it. As a poet, he *had* to go!"

# Quick Stoppers

## Angry Fire Extinguisher

There they were, several passengers in the cargo compartment of a Herk, minding their own business. Suddenly, a 50-pound fire extinguisher the crew was transporting just went wild and started spraying everyone with chlorobromomethane (CB). Four passengers ended up with the stuff directly in their faces, while everyone else, including the crew, was exposed to the unpleasant CB fumes. The crew donned their oxygen masks and made haste in descending, opening up the rear hatch and making for a nearby Canadian Forces base. The loadmaster also washed out the eyes of those pax who couldn't get out of the way of the extinguisher's fury in time. After an overnight stay, the pax were back in the air, sans the 50-pound extinguisher. Now let's see. Maybe the regulation requiring fresh water on board MAC aircraft is there for a good reason after all.

## The Washer Wasn't a Maytag!

The Air Force doesn't have many name-brand washers, especially the kind that wash airplanes. But here's what happened to an aircraft wash cart on a short trip from one overseas base to another. Duly loaded on a C-141B, said wash cart was among gobs of other cargo. But as the Starlifter was climbing through 15,000 feet, the loadmaster noted some strong fumes in the cargo compartment. The flight engineer turned off the underfloor heat and went to max pressurization and air flow. The fumes subsided, but the crew still did a smart 180-degree turn and headed back for the departure base. It didn't take long to find the origin of the fumes. It was the wash cart. Seems the fuel shutoff valve wasn't completely secured in the closed position which allowed fuel to leak out, causing considerable unrest among the pax and crew.

## You Picked a Fine Time to Leave Me, Loose (Turbine) Wheel

The crew of this particular Learjet was passing FL 200 when they heard a loud "bang." After the initial surge of adrenaline, they scanned the engine instruments, but all indications were normal. Absolutely nothing was amiss on the instruments, so they continued on their merry way, leveling at FL 370. Although any throttle movement above 95 percent $N_1$ produced some light vibrations and a little noise, there was still nothing to clue the crew that something was wrong with one of the engines.

About an hour and 50 minutes into the flight, though, the oil pressure on the number-one (left) engine dropped below 25 psi, and the crew shut down the engine. They declared an emergency, descended and completed an uneventful single-engine approach and landing at an Air Force base short of their destination.

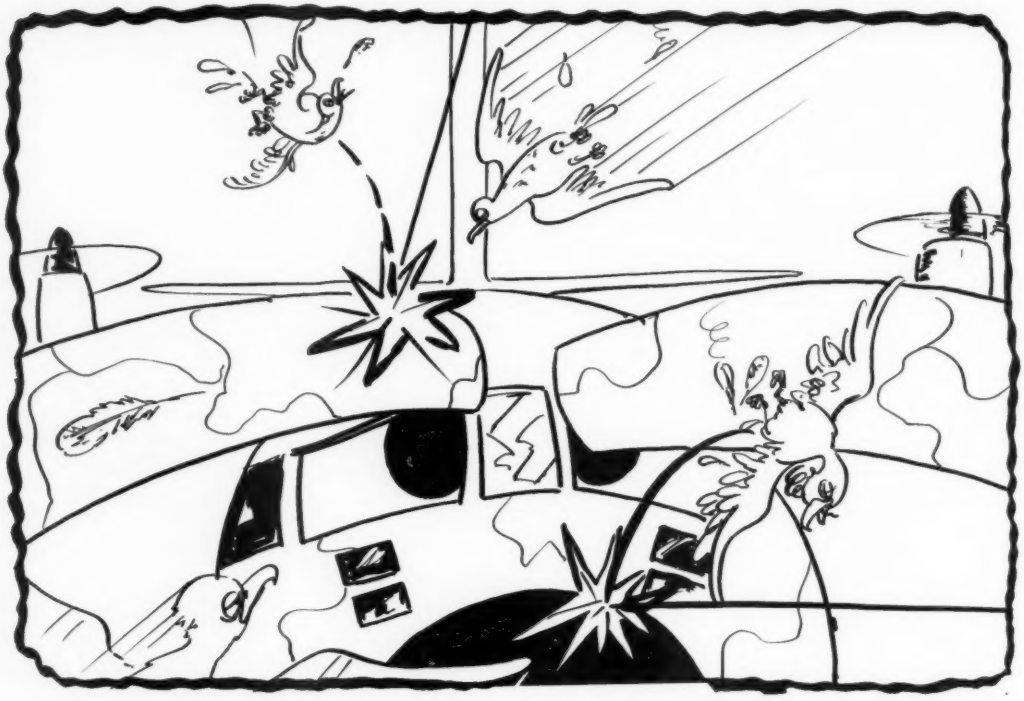
It didn't take long for the maintenance professionals to determine the cause of the oil loss. Seems the loud "bang" the crew had heard way back yonder was caused by the third stage turbine wheel separating from the engine. The loss of said turbine wheel caused a small, almost unnoticeable vibration, which in turn damaged an oil seal. Oil seeped from the damaged seal until the low pressure showed up on the engine instruments.

## Shorts Short on Oil

A half hour after takeoff, the crew of a Shorts 330-type aircraft noticed a left engine oil low-pressure light illuminate, and the associated pressure gauge fluxing 20 psi. A scan of the number-one engine confirmed the crew's worst fears, namely that it was covered in oil. The crew caged the engine IAW the flight manual and made an uneventful single-engine approach and landing at their destination field.

During the post flight inspection, it didn't take long for the crew to figure out the reason for the sudden oil leak—someone hadn't properly secured the oil servicing cap at the last stop. A thorough wipe down of the engine followed by a gulp or two of the black fluid and the Shorts was once again on its way.

# Quick Stoppers



## Suicidal Seagulls, Take Fifty!

Seagulls, the sea and seaside RON locales all go pretty much hand-in-hand. Florida bases are especially known for their ample amount of avian activity, so it behooves us all to beware lest we get scared to death, right?

Returning from an overwater training mission to RON at their balmy southern base, the crew of this Herk was preparing for the approach and listening to the ATIS broadcast for ". . . bird activity in the vicinity of the field." Since it was night, it was going to be hard to spot the critters, but the landing lights were on and the crew flew the approach. About 50 feet over the threshold, the landing lights illuminated a large flock of gulls. There wasn't time for evasive action, so it was every man—and gull—for himself. The crew heard several distinct impacts on the aircraft and knew some of the gulls were now dead ducks. After landing, the crew found the kamikaze gulls had cracked the nose radome, dented the right outboard leading edge, bent the anti-icing tube, and dented the right wing tip. Parts of seagulls were also found in the number-four oil cooler, number-one engine, and both wheel well areas. In all, over 50 gulls bit the dust that night.

The base safety officers determined that the reason the gulls were roosting on the overrun was because heavy rains had flooded the birds' natural nesting areas. Another reason for this incident was the fact that the ATIS, even though it had reported bird activity in the area, had not reported just how intense the bird activity was. Reduced nighttime vis also added to the severity of the mishap.

# After Deadlines

**"UNRECOVERABLE" C-130 TO FLY AGAIN**—People from AFLC's Warner Robins Air Logistics Center (WRALC) are engaged in a heroic project to recover a severely crash-damaged C-130E. The Herk crashed on landing at Cape Romanzoff, Alaska, in January 1985 during Operation Brim Frost. The C-130's number-one engine was destroyed, the number-two engine was damaged, the gas turbine compressor, left wheel well pod and landing gear pod were destroyed, four vertical beams were severed or cracked, and the aft center wing web was cracked. According to Col. David Hennessy, C-130 program manager at WRALC, MAC will bring in a replacement for the outer wing, which was burned in the crash. (Courtesy AFLC and MAC News Service)

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**RHEIN-MAIN'S 2nd AES ASSIST BEIRUT HOSTAGES**—Ninety-five members of the 2nd Aeromedical Evacuation Squadron at Rhein-Main AB, West Germany, helped ease the suffering of the 39 American hostages released from TWA Flight 847. After staying on alert for two and one-half weeks, the crew finally departed for Damascus, Syria, on a C-141. There, the crew waited for some 36 hours until about midnight, June 30, for the hostages to arrive. All the hostages were in relatively good condition, except for a few sore throats, colds, stomach ailments and a spider bite. They were all fatigued and some were dehydrated. This was not an unusual mission for the 2nd AES. They have been directly involved with such missions as the Iranian hostage crisis, all the Beirut bombing incidents, the Athens bombing and the Kuwait hijacking. From *TMF*, we say, "Thanks for being there!" (Courtesy MAC News Service)

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**MAC RESCUE UNIT ASSISTS IN AIR INDIA DISASTER**—Rescue aircraft from the 67th Aerospace Rescue and Recovery Squadron at RAF Woodbridge assisted in the recovery operation for the Air India jetliner that crashed into the Atlantic 120 miles west of Ireland on June 23. The squadron diverted an HC-130 which was en route from Keflavik, Iceland, to the scene, where it arrived about four hours after the crash. The squadron then launched another HC-130 and two HH-53 Super Jolly Green Giant helicopters from RAF Woodbridge. Maintenance people deployed with the crewmembers to the staging base at Shannon International Airport, Ireland. They kept the aircraft flying for 55 hours in support of the search effort. (Courtesy MAC News Service)

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**HC-130 INSTRUCTOR FLIGHT ENGINEERS NEEDED**—Here it is, the opportunity of a career. The 1550th Combat Crew Training Wing at Kirtland AFB, New Mexico, needs experienced instructor flight engineers. This is a controlled three-year tour and requires you to submit a special duty application, AF Form 109, at your CBPO. If this sounds like what you've been looking for, call CMSgt. Dathan Hughes at Autovon 576-4891. (Information courtesy 23 AF/DOV)

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**910th TAG RESERVISTS ASSIST IN OHIO RELIEF**—Reservists from the 910th Tactical Airlift Group supported the Ohio National Guard recently in clean-up efforts following a tornado in Niles, Ohio. Twenty-nine members of the 910th Weapons System Security Flight relieved local police in providing traffic and crowd control. The 910th Civil Engineering Squadron provided 41 people and some heavy equipment to remove rubble and search for survivors. They also provided equipment such as flashlights and fuel to civilian relief agencies. (Courtesy Air Force Reserve News Service)

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# Touch 'n Go

"Smedley? Oh, it's his week in the barrel making aircrew assignments."